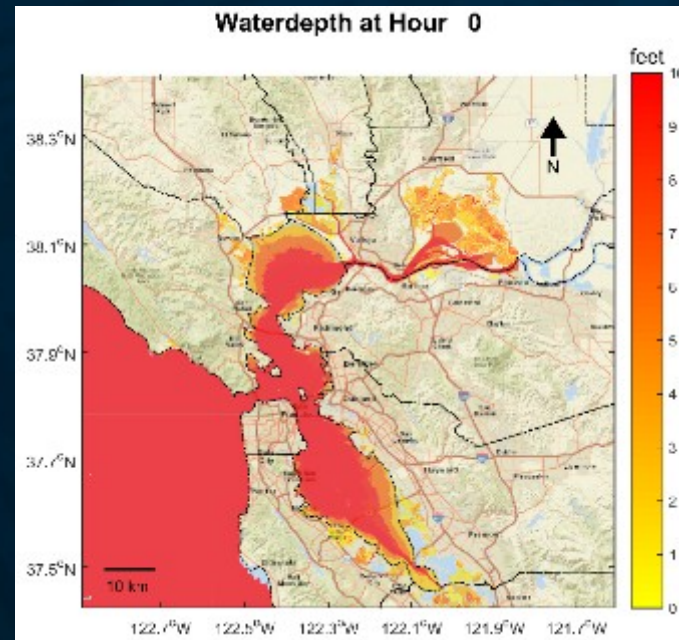
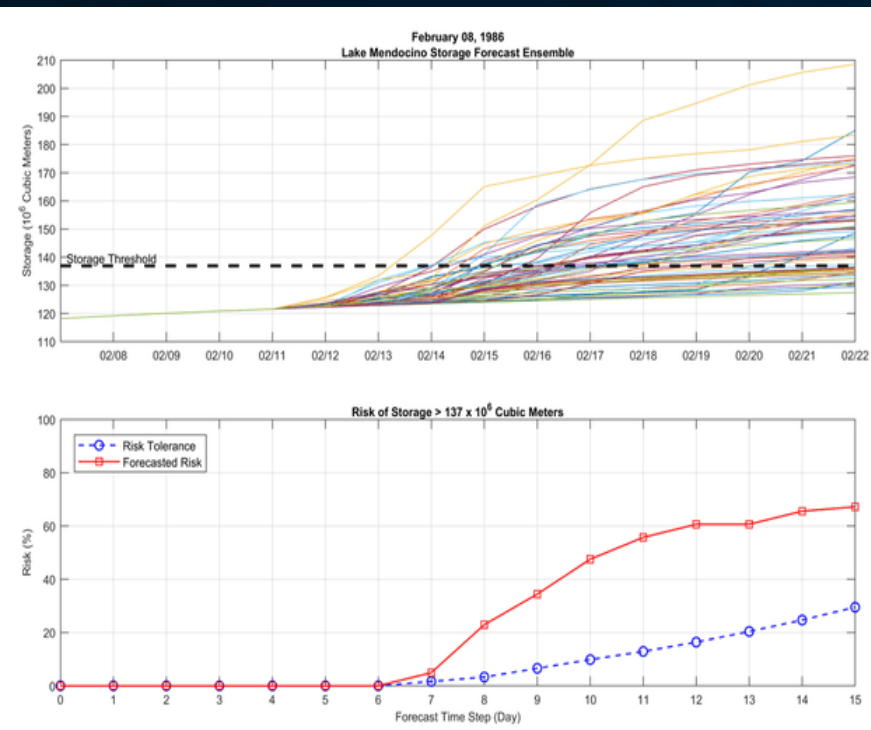




FIRO and AQPI – CDWR Involvement



Dr. Michael Anderson, State Climatologist

SWRR Panel

May 3, 2018

Summary Thoughts

- Atmospheric Rivers are a key component to California's water supply and flood risk. The character, size, number, and timing of atmospheric rivers play a key role in seasonal hydrologic outcomes for California.
- Improved observations and forecasting are key elements to improved decision support tools that can enable more options for water management in California.
- FIRO and AQPI represent opportunities to explore operational implementation of research concepts to advance integrated water management capabilities in a collaborative environment

**California's topography
affects our weather and climate**



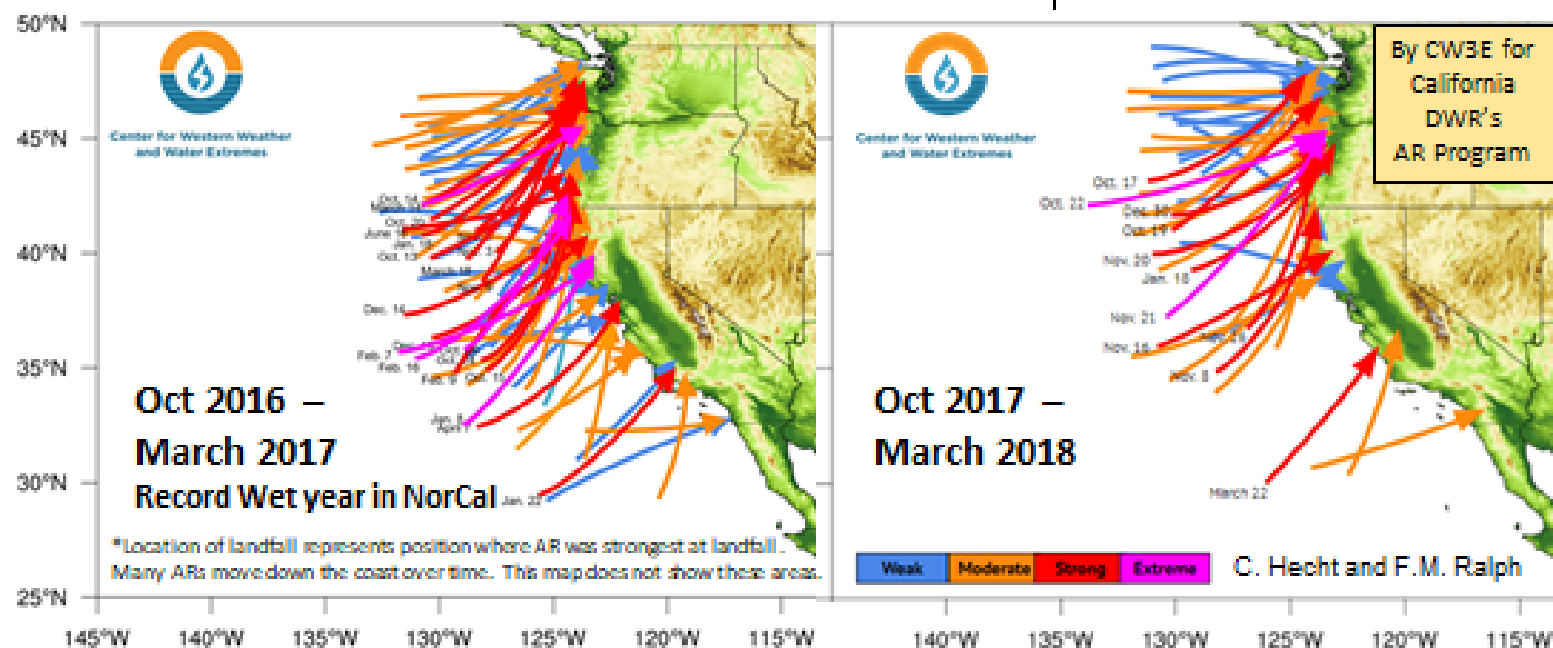
*The Bay Area's
complex
topography
offers unique
challenges*

Map of Landfalling* Atmospheric Rivers on the U.S. West Coast Through 31 March: Comparison of Water Years 2017 and 2018

During Water Year 2018 (thru 31 March), California had received about half as many landfalling ARs as in Water Year 2017 (thru 31 March)

Ralph/CW3E AR Strength Scale

- Weak: $IVT=250-500 \text{ kg m}^{-1} \text{ s}^{-1}$
- Moderate: $IVT=500-750 \text{ kg m}^{-1} \text{ s}^{-1}$
- Strong: $IVT=750-1000 \text{ kg m}^{-1} \text{ s}^{-1}$
- Extreme: $IVT=1000-1250 \text{ kg m}^{-1} \text{ s}^{-1}$
- Exceptional: $IVT>1250 \text{ kg m}^{-1} \text{ s}^{-1}$

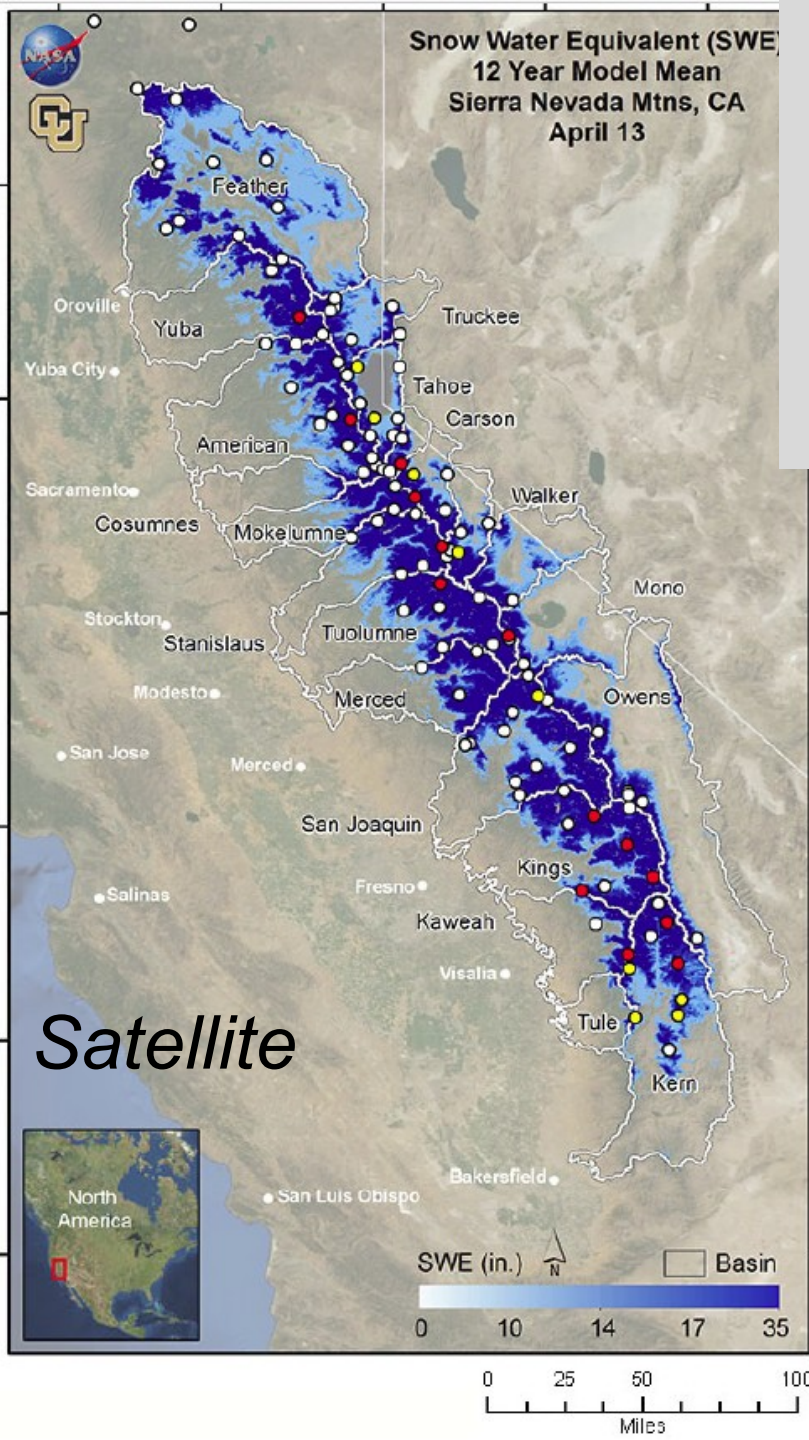


Center for Western Weather
and Water Extremes

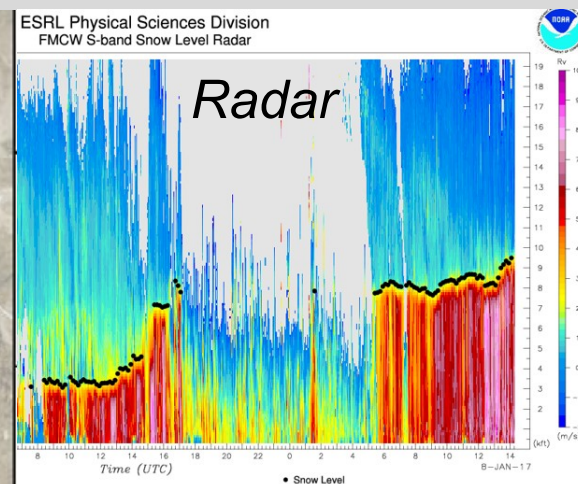
SCRIPPS INSTITUTION OF OCEANOGRAPHY
AT UC SAN DIEGO

By C. Hecht and F.M. Ralph

Experimental

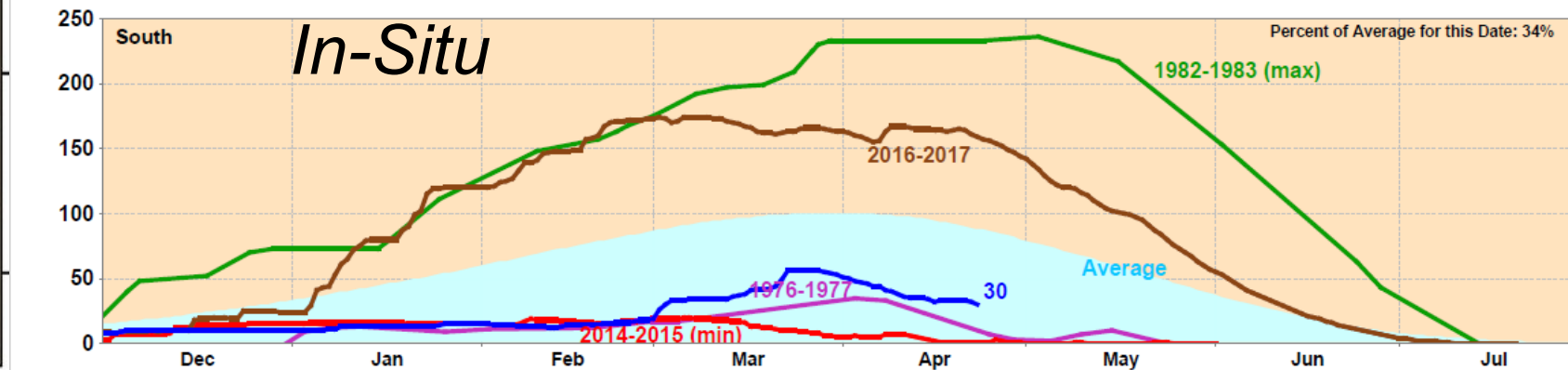
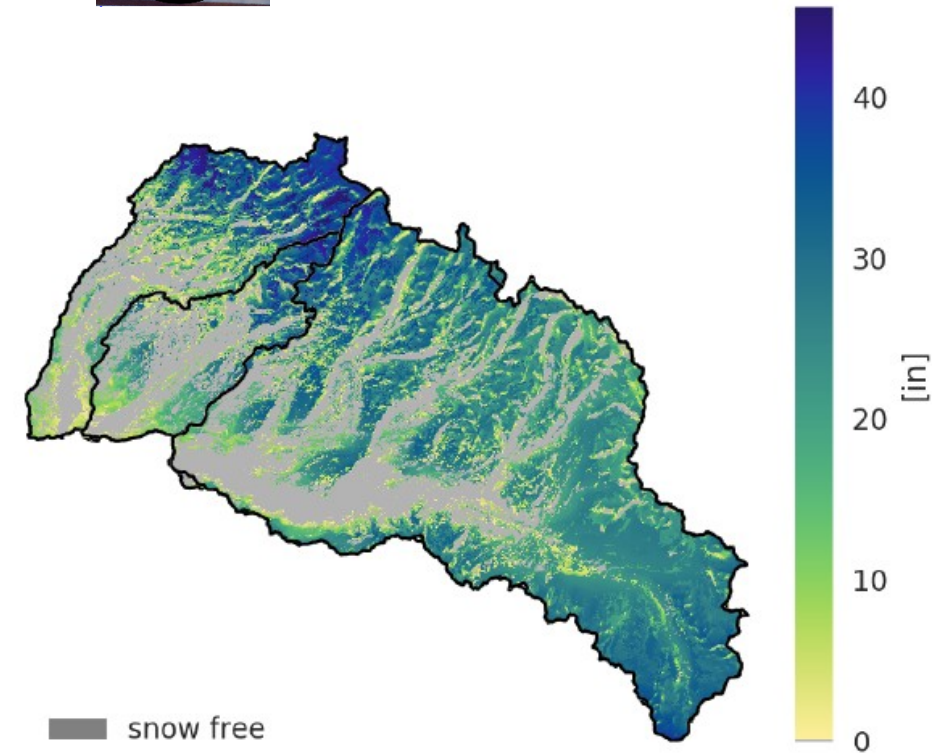


Goal: Integrated Observing Systems for Integrated Water Management



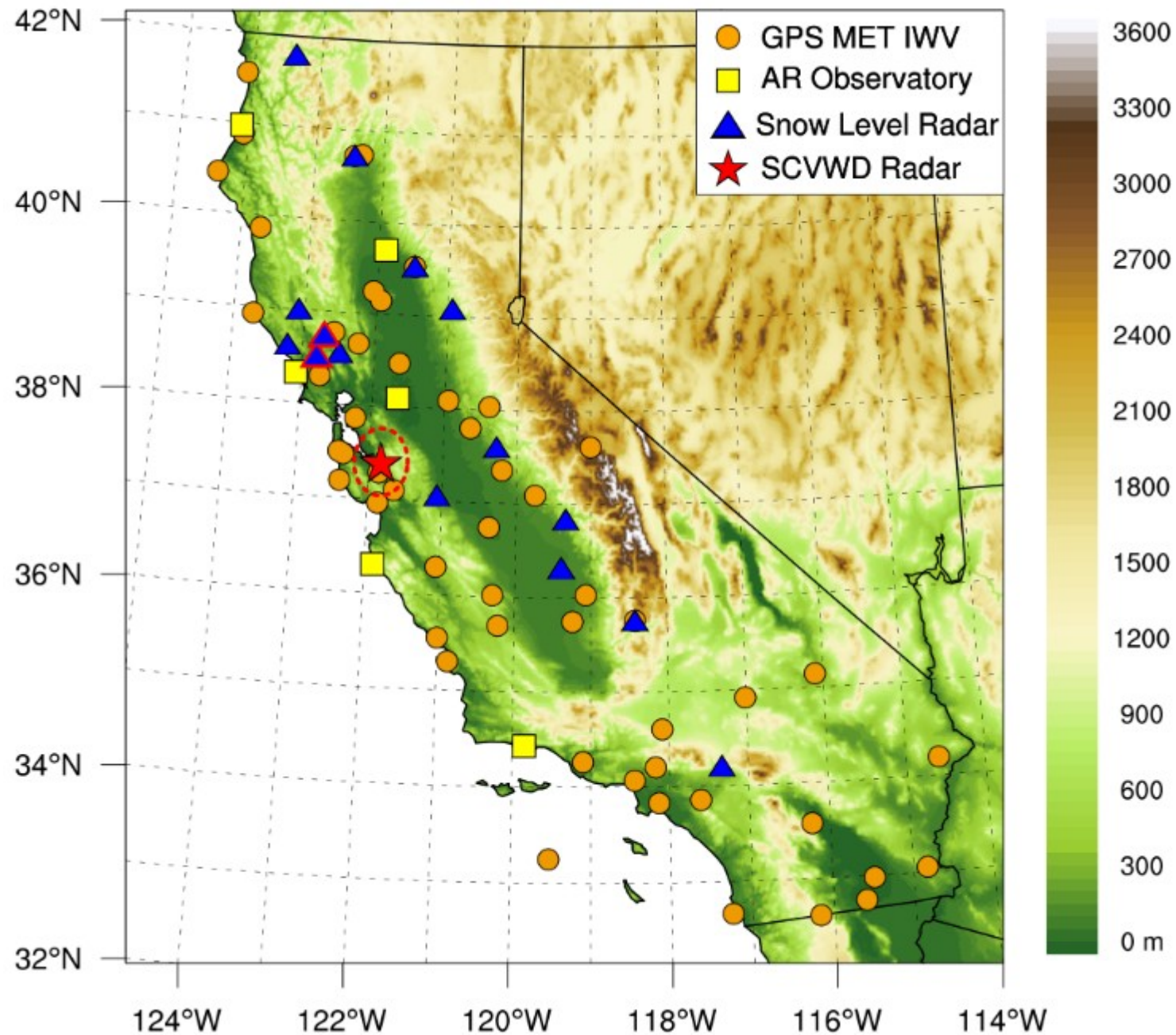
SWE
2018-4-16

Airborne



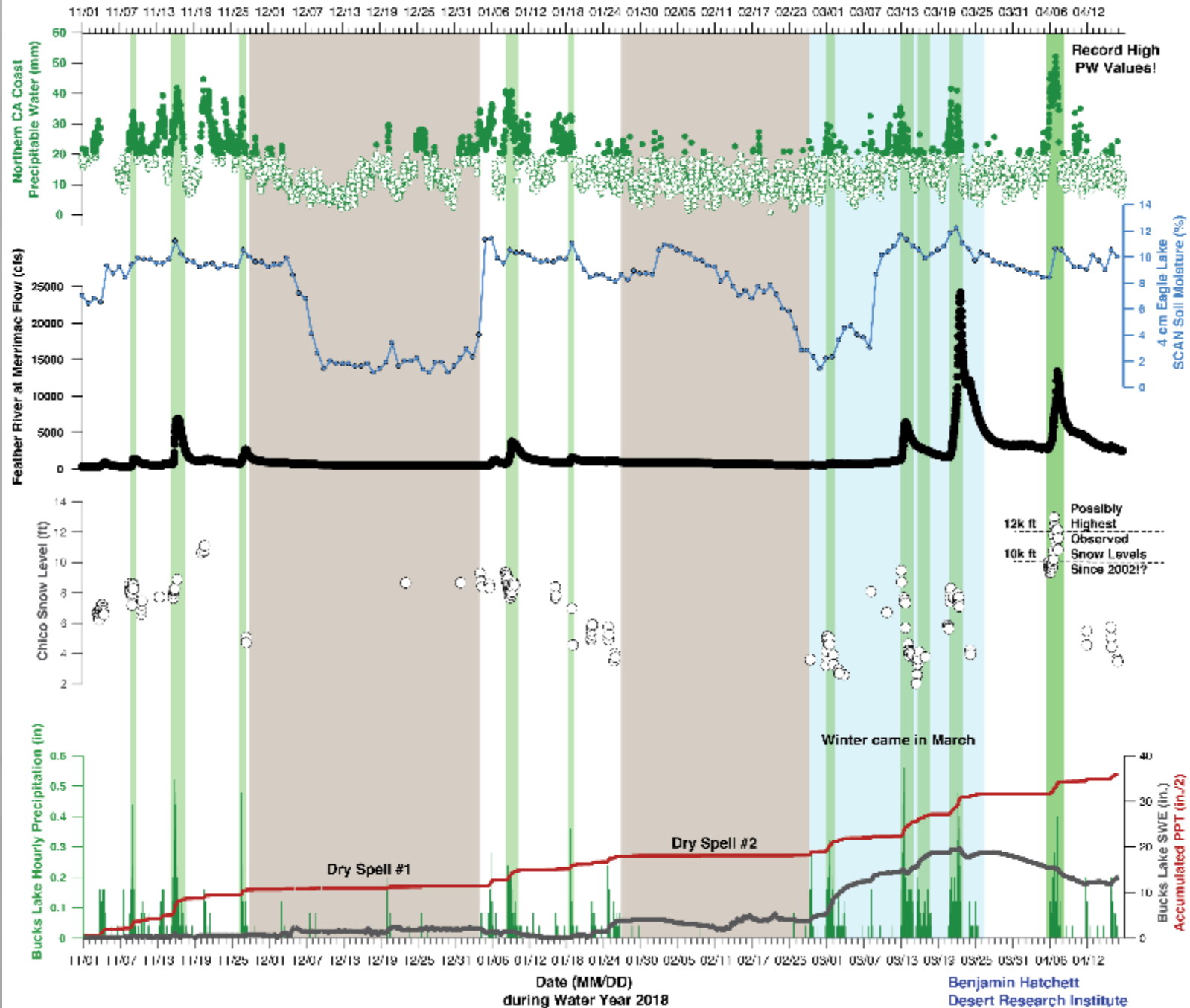
Statewide Percent of April 1: 32%

Statewide Percent of Average for Date: 37%



California's Advanced Observing System for Atmospheric Rivers

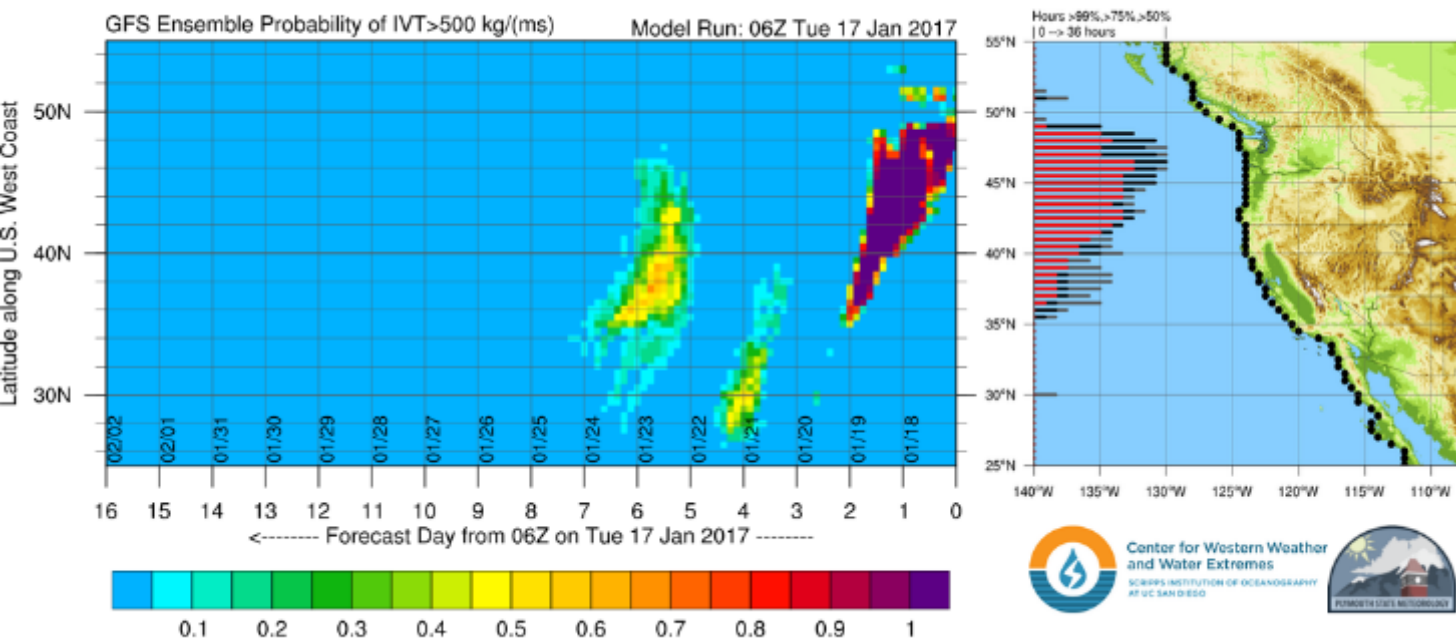
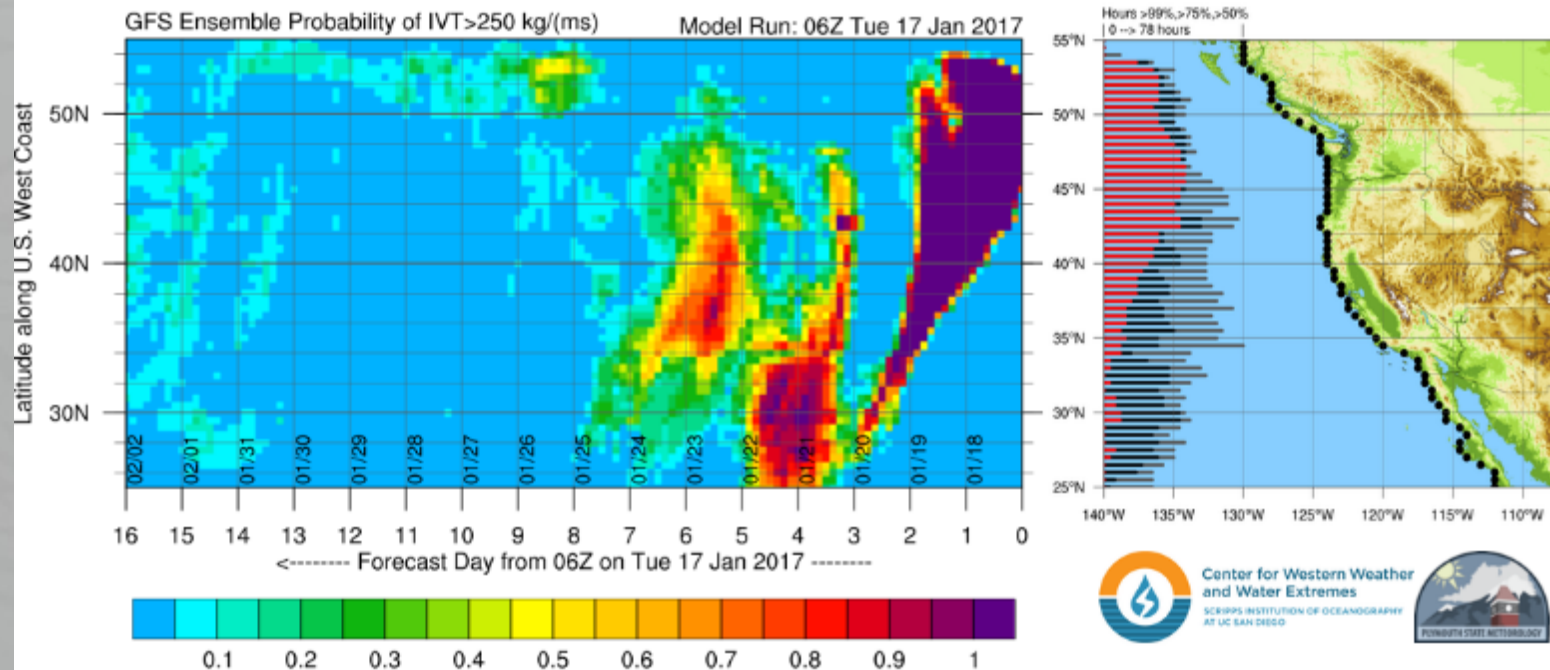




Date (MM/DD)
during Water Year 2018

Benjamin Hatchett
Desert Research Institute
Western Regional Climate Center

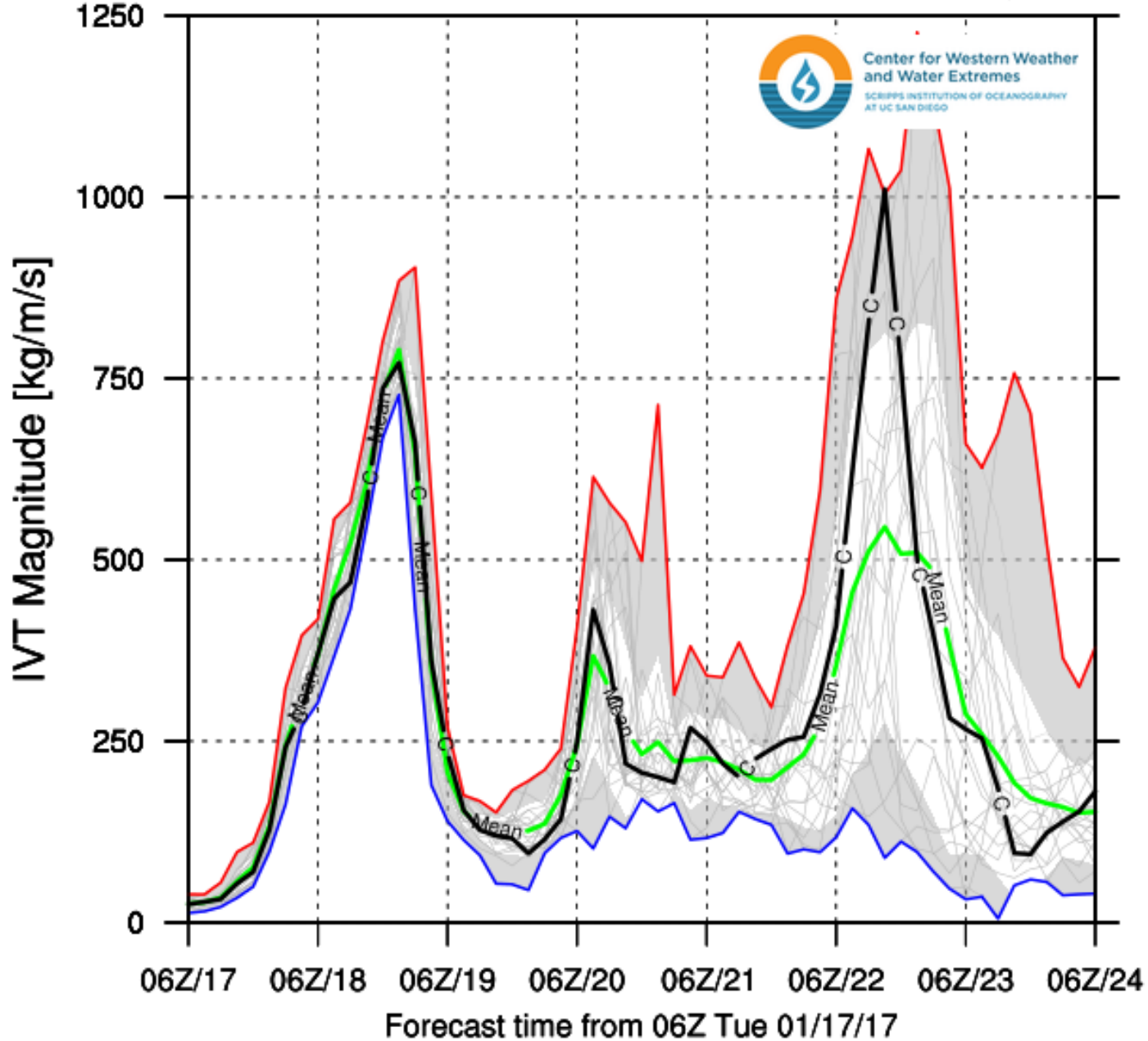
Forecast Tools from the Center for Western Weather and Water Extremes (CW3E)



AR Outlook Tool

GFS Ensemble Init: 06Z Tue 01/17/17

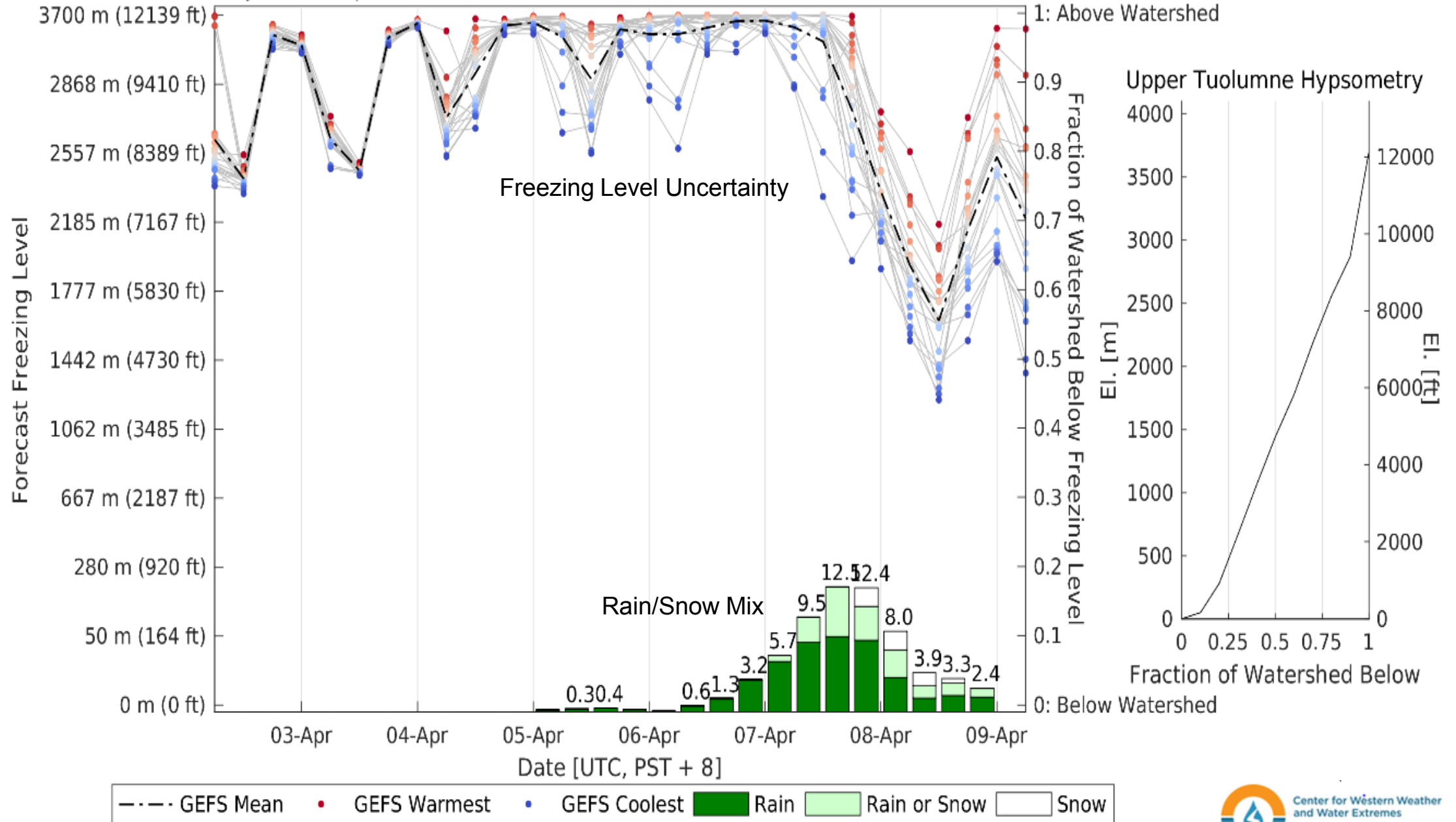
LatLon: 39N;124W



AR Strength Forecast and Uncertainty Tool

Upper Tuolumne Forecast Initialized 02-Apr 06Z

7-day WPC Precipitation Total: 64.1 mm (2.52 in) - 63% Rain, 28% Rain or Snow, 9% Snow



Forecast Informed Reservoir Operations



Figure 1 – Lake Mendocino Location Map

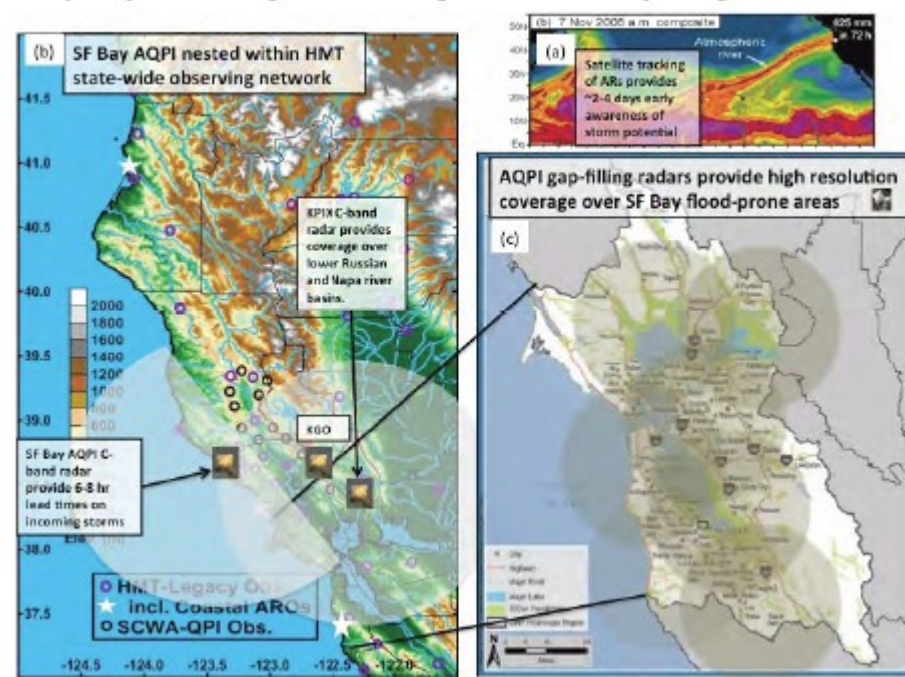


Figure 2 - Currently used reservoir storage guide curve defines maximum water supply capacity.

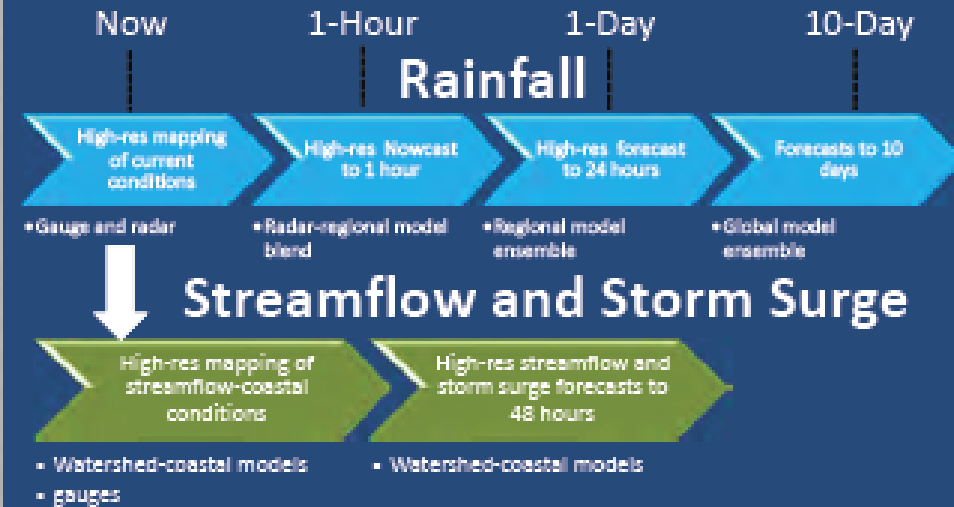
Using Forecasts and Advanced Observations to Support Reservoir Operations Decisions

Improve Supply Reliability, Stewardship, and Flood Management Capabilities

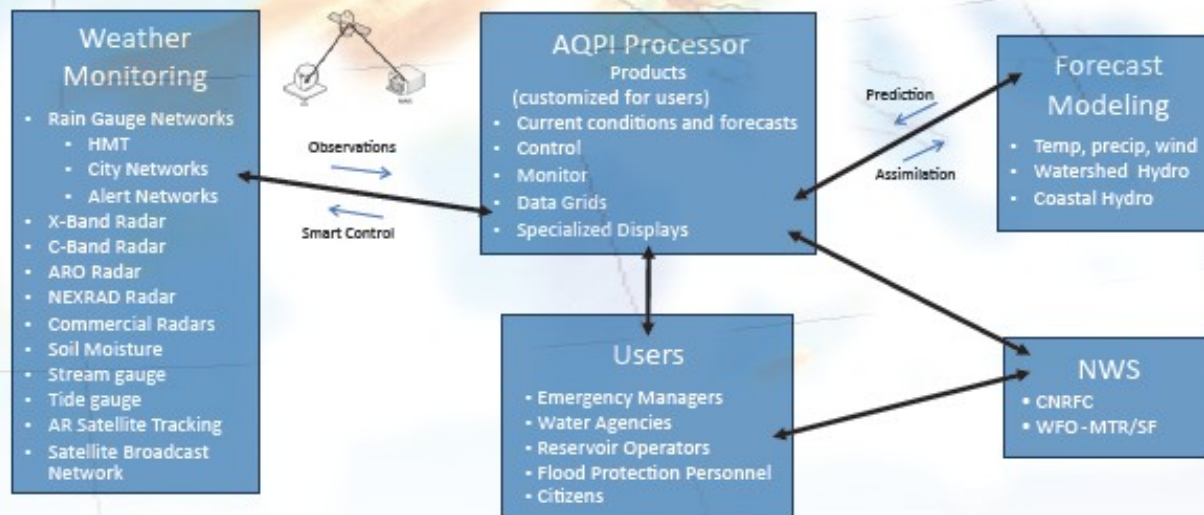
Conceptual layout of monitoring instrumentation augmentation across the Bay Area region.



AQPI: better monitoring of current and future weather and water conditions

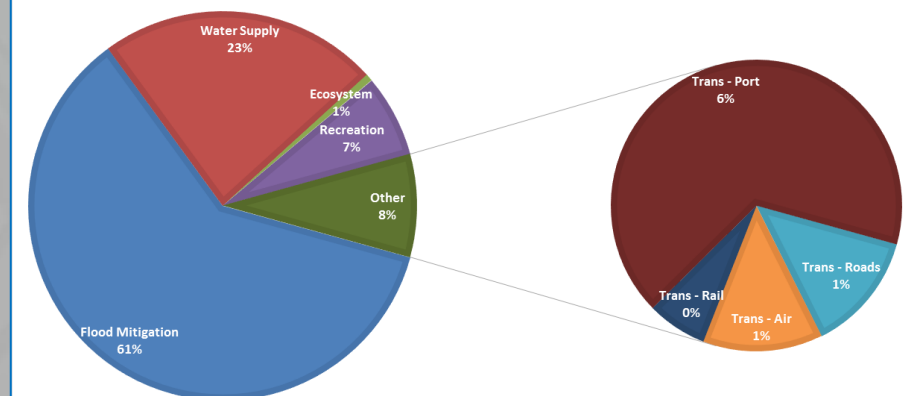


AQPI System



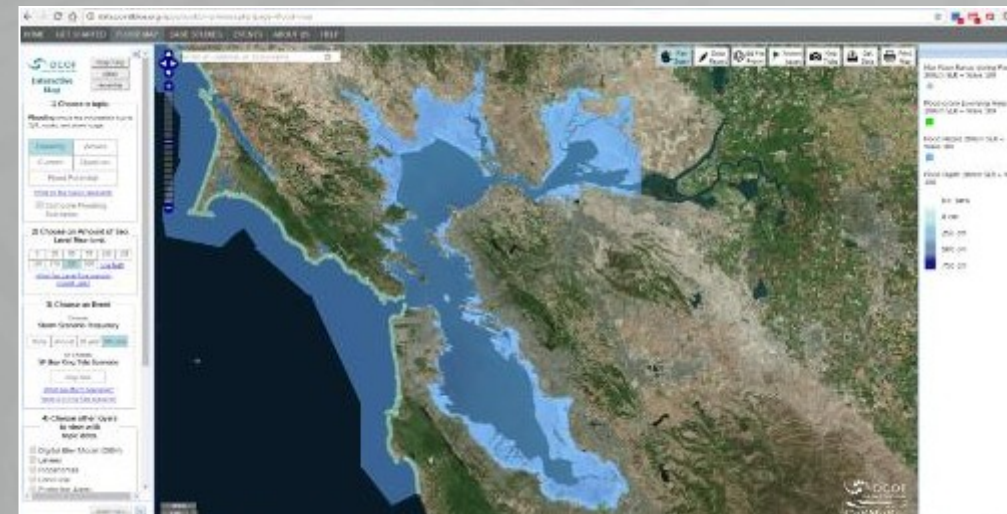
AQPI BENEFITS BY CATEGORY

■ Flood Mitigation
 ■ Water Supply
 ■ Ecosystem
 ■ Recreation
 ■ Trans - Roads
 ■ Trans - Air
 ■ Trans - Rail
 ■ Trans - Port



Coastal Storm Modeling System (CoSMoS)

- Physics-based numerical modeling system for assessing coastal hazards due to climate change
- Predicts coastal hazards for the full range of sea level rise (0-2, 5 m) and storm possibilities (up to 100 yr storm)
- Emphasis on directly supporting federal and state-supported climate change guidance
- New operational application for San Francisco Bay



The Bay Area Leading the Way

Successful alignment of local, state and federal agencies in collaborative engagement for multiple benefits

Engaging the research community to bring the best science to integrated resource management for a warming world

Lessons learned in FIRO and AQPI can be transferred to other parts of California